## CLAIMS

1. A coin (1) having a metal surface (2; 3) structured with macroscopic reliefs (5) for the representation of motifs which serve to specify the coin value and as a recognition feature, and fields (14; 14') of the surface (2; 3), which are arranged on a circular ring around the center point (18) of the coin and which have microscopically fine relief structures (8) with a diffraction action and which form an optically machine-readable identification, characterised in that the relief structures (8) in the fields (14; 14') are gratings (13) which are of the same spatial frequency f, and that the relief structures (8) differ by their azimuth ($\Omega$) relative to the radial direction and/or by a symmetrical or asymmetrical relief profile.

2. A coin (1) having a metal surface (2; 3) structured with macroscopic reliefs (5) for the representation of motifs which serve to specify the coin value and as a recognition feature, and fields (10; 11; 12; 14; 14'; 20) of the surface (2; 3), of which at least one has a microscopically fine relief structure (8) with a diffraction action and which form an optically machine-readable identification, characterised in that the relief structures (8) of the identification are selected from M groups of gratings (13), that the grating vectors (79) of all gratings (13) of the M groups are radially oriented, that in each of the M groups the spatial frequency f of the relief structure (8) is selected in dependence on the radial spacing (R) of the field (10; 11; 12; 14; 14'; 20) from the center point (18) of the coin (1) such that upon illumination of the relief structure (8) by means of a light source (21) in point form arranged perpendicularly above the center point (18), with the wavelength ($\lambda$), one of the two partial beams (29; 30; 84) of the diffracted light crosses the center point (18) at a spacing ($h_D$) which is predetermined for said group.

3. A coin (1) as set forth in claim 1 or claim 2 characterised in that the macroscopic relief structures (8) are arranged on the bottom of recesses (7) let into the surface (2; 3) of the coin (1).

4. A coin (1) as set forth in claim 3 characterised in that arranged in the recesses (7) is a suitable portion of a plastic material laminate containing the relief structures (8).

5. A coin (1) as set forth in one of claims 1 through 3 characterised in that the microscopic relief structures (8) are formed directly in the surface (2; 3) in the fields (10; 11; 12; 14; 14'; 20).

6. A coin (1) as set forth in one of claims 1 through 5 characterised in that the microscopic relief structures (8) are covered over with a transparent protective lacquer (9) which fills the grooves of the relief structures.

7. A coin tester comprising a reading device (19; 36) which includes light sources (21), photodetectors (22) and an electronic circuit (25) connected to the light sources (21) and the photodetectors (22) and which is adapted for machine checking of the identification with relief structures (8) of a coin (1) rolling or sliding in a coin passage (15) on a rolling surface (81), as set forth in claim 1, characterised in that a light source (21) is arranged for illuminating a surface (2; 3) of the coin (1) with approximately monochromatic light laterally in relation to the coin passage (15), that a chord of the coin (1) which is 1.5 mm wide maximum and which is perpendicular to the rolling plane (81) is illuminated with the perpendicularly incident light beams (34), that at least one photodetector (22) is associated with each relative azimuth (Ω) of the gratings (13), which is admissible for identification of the coins (1), that a diffractive optical element (33) for deflection of partial beams (29; 30) of the diffracted light of a field (14, 14') illuminated in the region of the chord at the height (H) is arranged between the coin passage (15) and the photodetectors (22) and that the diffractive optical element (33) is adapted to rotate the diffraction plane defined by the partial beams (29; 30) through a rolling angle (β) dependent on the height (H) with an axis of

rotation parallel to the light beams (34) upon the passage through the diffractive optical element (33), in such a way that after said passage the partial beams (29; 30) are oriented on to at least one photodetector (22) associated with the azimuth ($\Omega$).

8. A coin tester as set forth in claim 7 characterised in that a pair of photodetectors (22) is associated with each admissible relative azimuth ($\Omega$), that after rotation of the diffraction plane to compensate for the rolling angle ($\beta$) each of the two partial beams (29; 30) is oriented on to one of the two photodetectors (22) of the pair associated with the predetermined relative azimuth ($\Omega$), and that the electronic circuit (25) is adapted by way of the photodetectors (22) to detect asymmetry of the intensity of the two partial beams (29; 30).

9. A coin tester comprising a reading device (19; 36) which includes light sources (21), photodetectors (22) and an electronic circuit (25) connected to the light sources (21) and the photodetectors (22) and which is adapted for machine checking of the identification with relief structures (8) of a coin (1) rolling or sliding in a coin passage (15) on a rolling surface (81), as set forth in claim 2, characterised in that an optical axis (80) of the reading device (19; 36) is established by at least one photodetector (22) and at least one light source (21) in point form, that the optical axis (80) is oriented perpendicularly with respect to a side wall (16; 17) of the coin passage (15) and is at a spacing (a) from the rolling surface (81), which corresponds to the radius of the coin (1) to be tested, that the light source (21) is arranged at a spacing ($h_Q$) and each photodetector (22) is arranged at a spacing ($h_D$) from the surface (2; 3) of the coin (1) such that monochromatic light of the wavelength $\lambda$ emitted by the light source (21) is diffracted by at least one relief structure (8) of the coin (1) to be tested as a partial beam (29; 84) towards the optical axis (80) and is concentrated on the predetermined photodetector (22) arranged at the spacing ($h_D$), and that the electronic circuit (25) is adapted to recognise the passage of the center point (18) of the coin (1) through the optical axis (80) and the

authenticity of the coin (1) from the electrical signals of the photodetectors (22), which signals are proportional to the intensity of the partial beam (29; 84).

10. A coin tester as set forth in one of claims 7 through 9 characterised in that the monochromatic light beam (34) from the light source (21) is of a wavelength ($\lambda$) from a number of predetermined wavelengths ($\lambda_1$, $\lambda_2$), and that a command of the electronic circuit (25) to the light source (21) determines the wavelength ($\lambda$) of the emitted light beam (34).

11. A method of applying a microscopic relief structure (8) to a comparatively hard material surface (2, 3), characterised in that the microscopic relief structure (8) is produced by the removal of material by means of exposure of the material surface (2, 3) with a laser beam.

12. A method as set forth in claim 11 characterised in that the laser beam passes a mask (42) determining the form of the microscopic relief structure (8) and then an optical image-forming system (44) for reduction purposes.

13. A method as set forth in claim 11 characterised in that the laser in accordance with the method of dual beam interference produces on the material surface (2; 3) a microscopically fine interference pattern of a predetermined spatial frequency f and the material of the surface (2; 3) is removed at the locations of increased intensity in the interference pattern to produce the microscopic relief structure (8).

14. A method of applying a microscopic relief structure (8) to a comparatively hard material surface (2, 3), characterised by the following steps:

applying a thin light-sensitive plastic material layer to the material surface (2, 3),

exposing and developing the plastic material layer so that microscopically fine locations of the material surface (2, 3) are free of plastic material,

etching the material surface (2, 3), with the microscopic relief structure (8) being formed, and

removing the plastic material layer.

15. A method as set forth in one of claims 11 through 14 characterised in that the material surface (2, 3) with the previously produced relief structures (8) is hardened by nitriding.